

## Question 5: Pesticide Use Worksheets

Reference:

Applying Pesticides Correctly - A Guide for Private and Commercial Applicators

Unit 3: Formulations, Pages 3 through 8

### Formulations

The active ingredients in pesticides are the chemicals that control the target pest. Most pesticide products also have inert or inactive ingredients. Inert ingredients can dilute the pesticide, make it safer, more effective, easier to measure, mix, and apply, and/or more convenient to handle. Usually the pesticide is diluted in water, a petroleum-based solvent, or another diluent. Other chemicals in the product may include wetting agents, spreaders, stickers, or extenders. This mixture of active and inert ingredients is called a pesticide formulation.

## LIQUID FORMULATIONS

### Emulsifiable Concentrates (E or EC)

An emulsifiable concentrate formulation usually contains a liquid active ingredient, one or more petroleum based solvents, and an agent that allows the formulation to be mixed with water to form an emulsion. emulsifiable concentrates are among the most versatile formulations.

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| <b>Advantages:</b>    | <p>Relatively easy to handle, transport, and store.</p> <p>Little agitation required and they will not settle out while equipment is running.</p> <p>They are not abrasive and they do not plug screens or nozzles.</p> <p>They leave little visible residue on treated surfaces.</p>   |
| <b>Disadvantages:</b> | <p>High concentration makes it easy to overdose or underdose.</p> <p>May cause unwanted harm to plants and/or animals.</p> <p>Easily absorbed through skin of humans or animals.</p> <p>Solvents may cause rubber, plastic, and pump parts to deteriorate.</p> <p>May be corrosive and may cause pitting or discoloration of surface finishes.</p> <p>Are often flammable and should be used/stored away from heat or open flame.</p> |

### Solutions (S)

Solutions dissolve readily in liquids such as water or petroleum based solvents. When mixed with the solvent, they form a solution that will not settle out or separate. These formulations usually contain an active ingredient, the solvent, and one or more other ingredients. Solutions may be used in many type of sprayer indoors or outdoors.

### Ready To Use (RTU)

Ready to use products contain the correct amount of solvent when sold. No further dilution is required before application. These formulations are usually solutions in petroleum based solvents and contain small amounts, often 1 percent or less, of active ingredient per gallon.

### Concentrates (C or LC)

Concentrates must be further diluted with a liquid solvent before application. Occasionally the solvent is water, but more often the solvent is a specially refined oil or petroleum based solvent.

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| <b>Advantages:</b>    | No agitation is necessary.  |
| <b>Disadvantages:</b> | There are not very many pesticides available in this formulation. |

### Flowables (F or L)

Flowables are insoluble solids that are formulated with finely ground active ingredients mixed with a liquid, along with inert ingredients, to form a suspension.

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| <b>Advantages:</b>    | <p>Seldom clogs nozzles.</p> <p>Easy to handle and apply.</p>          |
| <b>Disadvantages:</b> | <p>Require moderate agitation.</p> <p>May leave a visible residue.</p> |

**Ultra Low Volume (ULV)**

Ultra low volume formulations are concentrates that may approach 100 percent active ingredient and are used as is or diluted with only small quantities of specified solvents. Ultra low volume formulations are used mostly in outdoor applications, such as in agriculture, forestry, and mosquito control programs.

- Advantages:**      Relatively easy to handle, transport, and store.  
                          Little agitation required.  
                          Not abrasive to equipment and does not plug screens and nozzles.  
                          Leaves little visible residue on treated surfaces.
- Disadvantages:**      Difficult to keep pesticide in the target site because of high drift hazard.  
                          Specialized application equipment required.  
                          Formulation easily absorbed through skin of humans or animals.  
                          Solvents may cause rubber, plastic, and pump parts to deteriorate.

**AEROSOL FORMULATIONS****Ready To Use (RTU)**

Aerosol formulations are usually sold in small, pressurized containers that release the pesticide as fine droplets. These products are used in localized areas both indoors and outdoors.

- Advantages:**      Aerosols are easily stored and convenient when purchasing small quantities.  
                          Retains potency over a fairly long time.
- Disadvantages:**      Has significant risk of inhalation exposure.  
                          Hazardous if punctured, overheated, or used near an open flame.  
                          Difficult to confine to a target site or specific pest.

**Smoke or Fog Generators**

Smoke or fog generators are formulations used in machines that break the liquid formulation into a fine mist or fog (aerosol) using a rapidly whirling disk or heated surface. These formulations are used mainly for insect control inside structures and for mosquito and biting fly control outdoors.

- Advantages:**      Easy way to fill entire space with pesticide.
- Disadvantages:**      Highly specialized use and equipment.  
                          May require respiratory protection to prevent inhalation exposure.

**DRY FORMULATIONS****Dusts (D)**

Dust formulations are usually ready to use and contain a low percentage of active ingredients, usually 1/2 to 10 percent, plus a very fine dry inert carrier made from talc, chalk, clay, nut hulls, or volcanic ash.

Dusts are always used dry. They easily drift into nontarget sites.

- Advantages:**      May be used where sprays might cause damage.
- Disadvantages:**      Wind can easily cause drift during application.  
                          Residue easily moved off target by air movement or water.  
                          May irritate eyes, nose, throat, and skin.  
                          Do not stick to surfaces like sprays.  
                          Formulation does not allow for even distribution of particles on surfaces.

**Granules (G)**

Granular formulations are similar to dust formulations except that granular particles are larger and heavier. The coarse particles are made from an absorptive material such as clay, corncobs, or walnut shells. The active ingredient either coats the outside of the granules or is absorbed into them. Granules may provide slow release of the pesticide. They need moisture to start pesticidal action and they may need to be incorporated into soil or planting medium. Granules may be hazardous to waterfowl and other birds that feed on the granules.

**Pellets (P or PS)**

Pellet formulations are usually similar to granular formulations and the terms often are interchanged. In a pellet formulation all the particles are the same weight and shape. The uniformity of the particles allows them to be applied in precision applications such as with pelleted seed.

**Baits (B)**

Bait formulations are an active ingredient mixed with food or other attractive substance. The bait either attracts the pests or is placed where the pests will find it. Baits are used to control ants, roaches, flies, and other insects, birds, rodents, and other mammals.

- Advantages:** Entire area need not be covered, because pest goes to bait.  
Control pests that move in and out of an area.
- Disadvantages:** Can be hazardous to children, pets, domestic animals, and nontarget wildlife.  
Pest may prefer the crop or other food to the bait.  
Dead pests may cause odor problems.  
Other animals may be poisoned as a result of feeding on the poisoned pests.

**Wettable Powders (W or WP)**

Wettable powders formulations are dry, finely ground, and look like dust. They are usually mixed with water for application as a spray. A few products, however, may be applied either as a dust or as a wettable powder. Wettable powders contain 5 to 95 percent active ingredient, usually 50 percent or more. Wettable powder particles do not dissolve in water. They settle out quickly unless constant agitation is used to keep them suspended. Wettable powders are one of the most widely used pesticide formulations. They can be used for most pest problems and in most types of spray equipment where agitation is possible.

- Advantages:** Easy to store, transport, handle, measure, and mix.  
Less likely to cause unwanted harm to treated plants, animals, and surfaces.  
Less skin and eye absorption than with some liquid formulations.
- Disadvantages:** Present an inhalation hazard while pouring and mixing the powder.  
Require constant agitation and quickly settle out if not agitated.  
Formulation is abrasive to many pumps and nozzles.  
Often clog nozzles and screens.  
Spray residues may be visible.

**Water Dispersible Granules (WDG) or Dry Flowables (DF)**

Water dispersible granular or dry flowable formulations are like wettable powder formulations, except the active ingredient is prepared as granule sized particles. When mixed in water, the granules become a fine powder. The formulation requires constant agitation to keep it suspended in water. They share many of the advantages and disadvantages of wettable powders.

**Microencapsulated (M)**

Microencapsulated formulations are particles of pesticides, liquid or dry, surrounded by a plastic coating. The formulated product is mixed with water and applied as a spray. Once applied, the capsule slowly releases the pesticide. The encapsulation process can prolong the active life of the pesticide by providing a timed release of the active ingredient.

- Advantages:** Safe for the applicator.  
Easy to mix, handle, and apply.  
Releases pesticide over a period of time.
- Disadvantages:** Constant agitation is necessary in tank.  
Some bees pick up capsules, carry them to the hive, and poison the entire hive.